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Farm & Home Science Vol. 8 No. 1, March 1947

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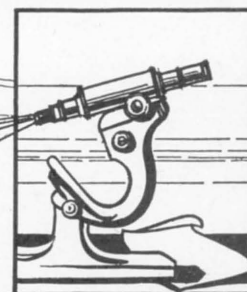
Recommended Citation

(1946) "Farm & Home Science Vol. 8 No. 1, March 1947," *Utah Science*: Vol. 8 : No. 1 , Article 1.
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FARM & HOME SCIENCE



PUBLISHED QUARTERLY BY THE UTAH AGRICULTURAL EXPERIMENT STATION

Volume 8

March 1947

Number 1

Quality, a Prime Factor in the Canning Pea Industry

By L. H. POLLARD and
H. B. PETERSON

THE FUTURE of the vegetable canning and freezing industries in Utah depends, to a considerable extent, upon the quality of crops produced. In the years prior to the war, consumers demanded high quality produce. This especially was true of frozen vegetables which had to compare favorably with the fresh. But in the canning industry, too, it was also important that vegetables be of high quality.

During the war, however, the public became more concerned with quantity than with quality. As a result, the acreages for canning and freezing vegetables were greatly expanded in the regular producing areas and, in addition, new areas were developed. Now, there is a reversion to prewar conditions and the consumer is demanding better quality.

There is little question about the necessity of reducing acreage of most canning crops. The question arises as to where this decrease should be made. Each area, of course, will strive to keep its production. It appears that those areas where high quality can be maintained, at relatively low production

costs, will be able to compete favorably and continue production at its present level.

In Utah, high quality is even more important than it is in many other sec-

to offset this differential, the processors should have a product which will command a premium on the market. The only possibility for this is to have better quality produce than competing areas.

While these difficulties present problems, they are not insurmountable, but they do require concerted action by growers and processors. Both must become increasingly aware of the need for an improvement in the quality. The future of canning and freezing pea industries largely resolves around the ability of growers and processors to improve the quality of the produce grown and processed. This can be done by better care of the growing crop and by processing the bulk of the crop during the time of prime quality. In other words, the growers and processors must be mutually interested in the welfare of the industry. There needs to be some added incentive, however, for the grower to produce better quality products. This incentive should be a differential in price such that it will pay him a premium to harvest his product when it has reached the proper stage of maturity.

In order to assist in this problem, the Utah Agricultural Experiment Station began studies several years ago on some factors influencing the quality of canning peas. The results of these studies are now being published and will be available in the near future. The aim of

QUALITY IN CANNING PEAS

1. There is little relationship between size of peas and quality
2. The tenderometer is the most satisfactory of the methods of grading in present use
3. The grower should receive the greatest returns per acre at the tenderometer value the processor desires to pack the bulk of his crop
4. Present contract prices have been adjusted to encourage quality production

tions. This is particularly true of canning peas. Utah produces only a small part of the total canning peas produced in the country. The acreage per grower is likewise much smaller here than it is in many other sections. Consequently, production cost usually is higher because of the inability of using labor saving devices in small areas.

Still another problem presents itself, that of higher freight rates of produce shipped from Utah compared to that shipped from most other areas. In order

This article is a brief summary of a bulletin now in press on "Maturity studies with canning peas," by the authors of this article and Dr. Ethelwyn B. Wilcox, research associate professor of home economics. Dr. Pollard, who has charge of the studies reported here, is head of the Vegetable Crops Department. Dr. Peterson is assistant professor of soils. He is also one of the authors of the fertilizer recommendations printed in this issue.

(Continued on page 14)



- (1) Dr. B. L. Richards, head of the department, and dean of the Graduate School, has been on the faculty since 1913. Over half his time is spent in research dealing with virus diseases of stone fruits, especially western x disease.
- (2) Dr. H. L. Blood is employed by the U.S.D.A. and spends his time on tomato disease problems. He has been connected with the institution since 1926.
- (3) Dr. F. B. Wann, associate professor, is a plant physiologist, whose main research interests have been with nutritional deficiency diseases of plants, of which chlorosis is the most important. He came to the college in 1926.
- (4) A. H. Holmgren, assistant professor of botany and curator of the Intermountain Herbarium, teaches the classes in taxonomy. He is now working on two publications, a flora of Utah and one of the Intermountain Area. He joined the staff in 1943.
- (5) Dr. W. S. Boyle, assistant professor of botany, teaches the class work in general botany. He came in 1945 from the Western Regional Research Laboratory at Albany, California.
- (6) Dr. E. L. Waldee, associate professor, is a recent addition in plant pathology. He will work on diseases of celery and potatoes. Dr. Waldee acted as an agricultural advisor to the MacArthur staff in Japan, and was on the staff at Iowa State College before coming here.



Department of Botany and Plant Pathology

BOTANY, the science of plant life, is basic to the various branches of agriculture and forestry and at the same time is a fundamental part of the field of general education. For this reason, the Department of Botany is administered jointly by the School of Agriculture and the School of Arts and Sciences. One of the important functions of the department is to provide basic training in the various aspects of plant science upon which students may build the structure of the more specialized fields, such as agronomy, horticulture, forestry. At the same time the course offering must be of sufficient diversity and depth to impart to the student the general cultural values of the science. Finally the department provides the special training demanded by several specialized fields of botany, particularly those of plant pathology, plant physiology, taxonomy, and cytology.

This advanced training in the several botanical fields leading to the M.S. degree is made possible largely through the support provided by the Agricultural Experiment Station, the Intermountain Herbarium, and the cooperating agencies of the U. S. Department of Agriculture.

The research activities of the depart-

ment have for many years centered around plant disease problems. Some of the earlier studies dealt with diseases of the potato and sugar beet, followed by investigation on alfalfa and tomato diseases. More recently the virus diseases of stone fruits have been receiving major attention. Following the identification of western x of peach as a virus disease of great economic importance, more than 20 other virus diseases of stone fruits have been found in Utah. Investigations on these diseases are progressing in cooperation with the U. S. Department of Agriculture.

Federal cooperation is also supplied in the investigations on curly top and other diseases of the tomato. Significant contributions have been made in the control of bacterial canker of tomato and progress is being achieved in the breeding of varieties resistant to curly top and Verticillium wilt.

In the field of nutritional diseases iron deficiency chlorosis is without doubt the most important disease problem in the state. The exact nature of chlorosis remains a mystery, but certain control measures have been devised which help to keep the disease temporarily in check. In the case of Concord grapes a satisfactory control has

been discovered in use of vinifera varieties as rootstocks. Other nutritional diseases which have received attention are little leaf or zinc deficiency and manganese deficiency.

The recent appointment of an additional pathologist in the department will permit a more intensive study of virus diseases of the potato. These investigations will form an integral part of the program to develop a source of foundation potato seed in cooperation with the Crop Improvement Association. The department will also be able to attack seriously some of the disease problems that appear to be threatening the celery industry of the state.

While the Intermountain Herbarium is administered as a separate unit there is close cooperation and integration with the Botany Department. The herbarium has contributed materially to the basic information relative to the natural plant resources of the state and assists many state agencies through the plant identification services which it renders. The herbarium at present houses a collection of some 70,000 plant specimens from the Great Basin region and this collection will serve as the basic material for a general flora of the region, soon to be published.

Methods of Preserving Eggs

Eggs Keep Best When Dipped in Oil or Packed in Waterglass

By KATHERINE E. MORRELL, ETHELWYN B. WILCOX, and CARROLL I. DRAPER

IN THE SPRING when eggs are plentiful and prices are low, it may be advisable to store them for the time when they are scarce. Both the economy-wise housewife and the commercial producer and handler are interested in the best methods of egg preservation. Various reports concerning egg treatment and storage appear from time to time, but the housewife and commercial dealer usually are not in a position to determine their relative merits.

An experiment was accordingly conducted by the nutrition laboratory in collaboration with the Poultry Department of the Utah Agricultural Experiment Station for the purpose of comparing the results of various methods of treatment and storage on eggs under home and commercial conditions as they exist in Utah. Climate and temperature affect the keeping qualities of eggs as well as possibly necessitating adjustments in the treatment recommended. These factors were taken into consideration in planning and executing this study on the effect of room, basement, and refrigerator storage on eggs with four types of treatment.

Experiment

Over 400 fresh, clean White Leghorn eggs from the Poultry Department were used. The day after laying, the eggs to be tested received the following treatments and types of storage: (1) no treatment—stored in a mechanical refrigerator, a basement, and a room at ordinary temperature; (2) placed in waterglass—stored in a basement; (3) dipped in mineral oil—stored at refrigerator and room temperatures; (4) given the flash heat treatment—stored at refrigerator, basement, and room temperatures. The “no treatment” eggs received no preliminary treatment before storing; the “waterglass” eggs were placed in a glass jar containing a solution made by mixing one part of sodium silicate to nine parts of boiled and cooled water; the “mineral oil” eggs

were dipped in mineral oil, allowed to remain in it for a few seconds, and then drained; the flash heat treatment was carried out by placing six eggs in a single layer in a wire basket and immersing it in a boiling water bath for various periods of time from 7 to 30 seconds to determine the optimum exposure time at this altitude (4500 ft.).

After the eggs had been exposed to the heat treatment they were allowed to cool before being stored. All eggs except the waterglass eggs were packed in regular paper egg cartons for storage. The kind of storage selected for each type of treatment was determined by the usual storage facilities used by var-

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Fig. 1. Treated and untreated eggs under various conditions of storage

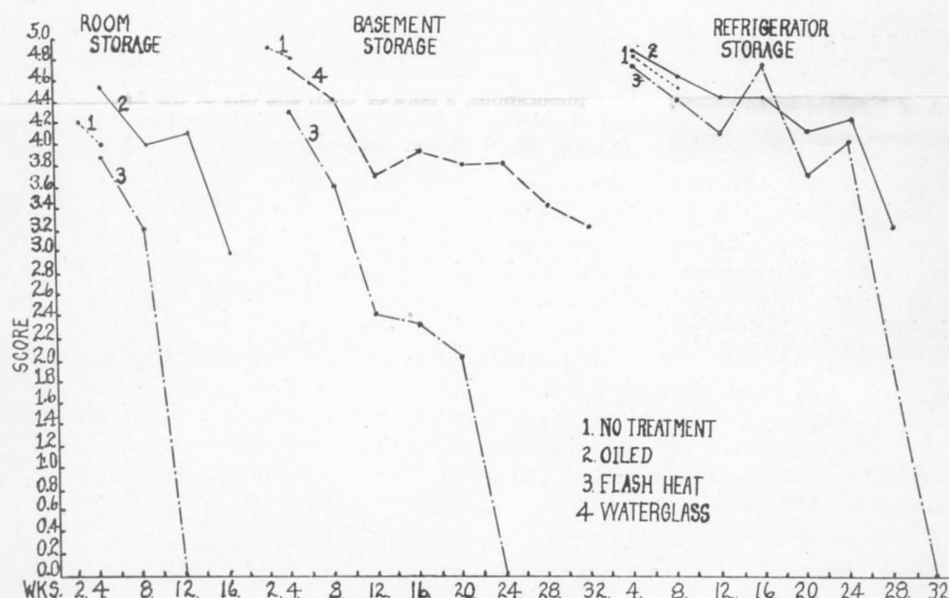
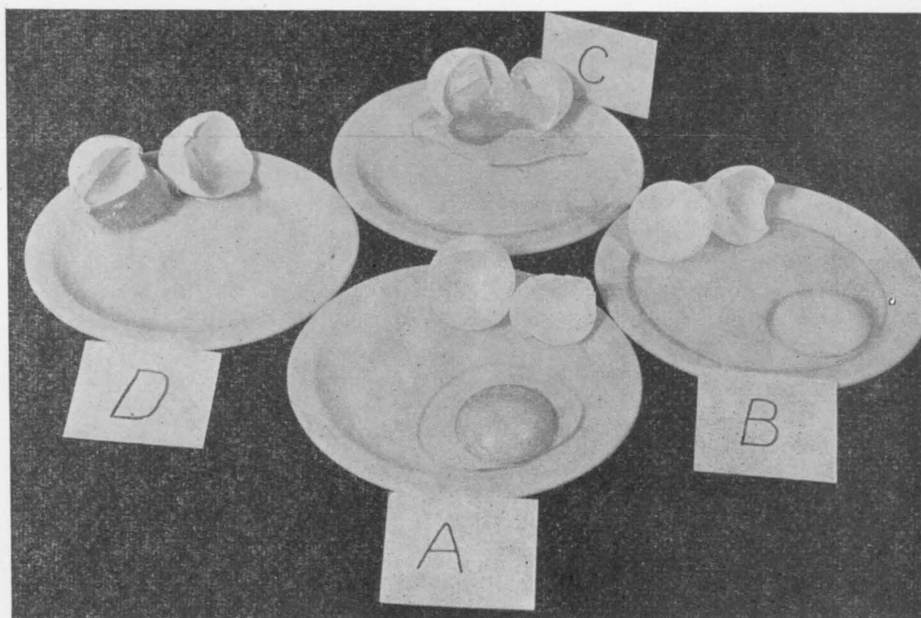


Fig. 2. Effect of different methods of treating and storing eggs. A, a fresh egg; B, a waterglass egg stored in a basement; C, a flash heat treated egg stored in a refrigerator; D, a flash heat treated egg stored in a basement. The storage period was 32 weeks



Katherine E. Morrell is assisting Dr. Ethelwyn B. Wilcox in nutrition research. She was formerly a member of the faculty in Home Economics. Dr. Wilcox is in charge of the research program in nutrition. Dr. Carroll I. Draper is associate professor of poultry husbandry.

FARM AND HOME SCIENCE

Published Quarterly by the Utah
Agricultural Experiment Station

Logan, Utah

R. H. WALKER, Director
GLADYS L. HARRISON, Editor

Address correspondence regarding material appearing in these columns either to the editor or to the author.

More detailed information on the subjects discussed here can often be found in Station bulletins and circulars or may be had through correspondence.

College series no. 762

MARKETING RESEARCH

REPRESENTATIVES of the Utah Agricultural Experiment Station, the Extension Service and the State Department of Agriculture have been meeting during the past few months with various agricultural organizations and commodity groups to discuss their marketing needs preliminary to formulating a marketing program for the state. This program will be submitted to the United States Department of Agriculture under the provisions of the Hope-Flannagan Act, otherwise known as the Agricultural Research and Marketing Act of 1946.

Title II of this act declares "that a sound, efficient, and privately operated system for distributing and marketing agricultural products is essential to a prosperous agriculture and is indispensable to the maintenance of full employment and to the welfare, prosperity, and health of the nation. It is further declared to be the policy of Congress to promote through research, study, experimentation, and through cooperation among federal and state agencies, farm organizations, and private industry, a scientific approach to the problems of marketing, transportation, and distribution of agricultural products . . . so that such products capable of being marketed in abundance may be marketed in an orderly manner and efficiently distributed."

Representatives of the Experiment Station have considered it desirable to meet with various farm groups, including producers, dealers and consumers to discuss their marketing problems and needs in order to give them a better understanding of what the fundamental marketing problems are. Consequent-

RECOMMENDED FERTILIZER PRACTICES FOR 1947

While Most Fertilizers Will Be Scarce Increased Supplies of Nitrogen, But Not Much Change in Phosphate Situation Predicted During Coming Season

By D. W. THORNE and H. B. PETERSON

Supply Outlook for 1947

THERE WILL probably be an increased supply of nitrogen fertilizer in Utah in 1947 over that available in 1946, but the phosphate situation is only slightly improved. The two principal sources of nitrogen are ammonium sulfate, produced at the steel mills near Provo, and synthetic ammonium nitrate, shipped here from British Columbia or other areas. There will be only limited quantities of treble superphosphate, which has been popular in the western states, but Simplot single superphosphate from Pocatello will be slightly more plentiful. In addition, some 20 percent superphosphate will be shipped in from eastern plants by the Production and Marketing Administration (formerly AAA).

An increasing proportion of plant food will probably be sold in mixed fertilizers in comparison with previous years. Unfortunately, the mixed fertilizers will consist of little of the low cost and high analysis ammonium phosphates—16-20-0 and 11-48-0—and more

For the past four years, Dr. Thorne and Dr. Peterson of the Agronomy Department have prepared recommended fertilizer practices in cooperation with a committee of specialists of the Station and the State Department of Agriculture.

ly, meetings were first called with the agricultural organizations and then with representatives from various production groups as follows: turkey and poultry, fruit and vegetable, dairy, grain, range livestock, and seed improvement.

From the information gained from these discussions the three agencies will work together in developing an effective marketing program for the state which will be submitted to the Secretary of Agriculture in anticipation that when funds become available under this act, the program as outlined will be supported by these funds. Such funds must be matched by the state, consequently all three state agencies, the Agricultural Experiment Station, the Extension Service and the State Department of Agriculture are asking the present Legislature for matching funds to conduct this work.

of the lower grade and more expensive types.

The supply will again be considerably less than demand. Farmers should place orders immediately for the year's supply. Since many substitutions must be made, the following suggestions are offered:

Types of Simple Fertilizers Nitrogen Fertilizers

Ammonium Sulfate

This is the most common nitrogen fertilizer used in Utah. It contains about 20 to 21 percent of nitrogen (20-0-0). The average selling price is about \$2.45 per hundred, with a nitrogen cost of about 12 cents per pound.

Ammonium Nitrate

A good nitrogen fertilizer produced largely in synthetic nitrogen factories built for the manufacture of explosives. The pure product contains about 33 percent nitrogen (33-0-0) and sells for about \$4.20 a hundred. This gives an average cost of about 12½ cents per pound of nitrogen which compares favorably with the cost of ammonium sulfate. With its present excellent physical condition, ammonium nitrate is a good buy in nitrogen fertilizers. Apply about 65 lbs. for each recommended 100 lbs. of 20-0-0.

Phosphate Fertilizers

Until about four years ago, most Utah farmers thought only of phosphate when considering commercial fertilizers. Studies by sugar beet companies during the past few years indicate that some land cropped frequently to sugar beets has been built up in phosphate to unusually high levels. Consequently, it is now important to watch the balance between phosphate and nitrogen, rather than thinking primarily of phosphate alone.

Treble Superphosphate

In the past, this has been the most commonly used phosphate fertilizer in the Intermountain States. For this reason, most of the fertilizer recommendations are based on the use of this product. It contains 43 percent available phosphoric acid (0-43-0). At an average cost of about \$2.75 per hundred, each pound of available phosphoric acid is worth about 6.4 cents.



Broadcasting commercial fertilizer and harrowing on irrigated pasture in early spring

Single Superphosphate

During the past few years, considerable single superphosphate containing 20 percent available phosphoric acid (0-20-0) has been distributed by the AAA. The Simplot Company at Pocatello is producing an 18 percent grade (0-18-0) which has sold for \$1.50 a hundred. This gives an average cost of 8.3 cents per pound of available phosphoric acid, which is nearly 30 percent above the cost of phosphate in more concentrated fertilizer. The single superphosphate contains almost 50 percent by weight of gypsum, but this probably has no economic value on most farm soils in Utah. Applications of about 200 to 250 lbs. of 0-18-0 should be made for each 100 lbs. of 0-43-0.

Ground Rock Phosphate

Each year some ground rock phosphate is sold in Utah. **Do not buy this product.** Experiments with this material

have failed to show any value from its use in states of the arid West.

Colloidal Phosphate

This is a special preparation of ground rock phosphate. The statements on rock phosphate apply also to this product. It is not recommended for use in this state.

Mixed Fertilizers

There will probably be a large variety of mixed fertilizers available this year. Some are priced too high; others may be reasonable. In general, however, the price per pound of plant food is more in mixed fertilizers than in single carriers because of additional costs for mixing and handling. In buying mixed fertilizers, select a combination of plant nutrients to meet the needs of your soils and crops and then estimate the relative cost per pound of plant food of each product available that meets your need.

Mixed fertilizers should be judged on the basis of the guaranteed analysis on

the bag plus the physical condition in relation to drilling characteristics. The guaranteed analysis on the bag is made up of three figures, such as 5-15-10. The meaning of these symbols is as follows:

The first figure, 5, means 5 percent total nitrogen.

The second figure, 15, means 15 percent available phosphoric acid (P_2O_5).

The third figure, 10, means 10 percent water soluble potash (K_2O).

In most cases, mixed fertilizers needed in Utah are those containing nitrogen and phosphate, but not potash. There are two general types: A. Those having a relatively high nitrogen to phosphate ratio. These include those with simple proportions of nitrogen to phosphorus between 1 to 1 and 1 to 2. B. Those having a relatively low nitrogen to phosphate ratio. These include those with simple proportions of nitro-

(Continued on page 11)



In this 5-acre field 3 series of pasture plots were established in 1943. They have been grazed three times each season, and quantitative data obtained prior to each grazing. This field has provided the data which are summarized in this and a preceding report

MORE PRODUCTIVE GRASS AND LEGUME PASTURES FOR DAIRY CATTLE ON IRRIGATED LANDS

By WESLEY KELLER,
GEORGE Q. BATEMAN and
J. ELMO PACKER

THREE YEARS' data have shown that for fertile soils, and under rotation grazing, standard pasture mixture no. 1, which has been so widely used in the Intermountain region, is relatively low in productivity. High yielding mixtures contain either brome, orchard, or tall fescue, with either red clover, ladino clover, or alfalfa as the legume, or combinations of these species, 10 such combinations averaging 50 percent more than standard mixture no. 1. In contrast, if Kentucky blue, meadow fescue, meadow foxtail, or perennial rye is the predominant grass, with either strawberry clover or any of several sources of ordinary white clover as the predominant legume, or any of these species in combination, yields are relatively low, 8 such combinations averaging only 84 percent as much as stan-

This is the second report on the pasture studies by the authors. The first appeared in the December 1945 issue, and reported the results of two years' work. Another year's data are summarized here.

This is a cooperative study with the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering. Dr. Wesley Keller is geneticist with that bureau working with grasses. George Q. Bateman is superintendent of the Dairy Experimental Farm and J. Elmo Packer is research assistant in dairy husbandry on the Station staff.

dard mixture no. 1. Reed canary grass is both productive and palatable, but tall fescue is very low in palatability.

In this study quantitative data were obtained prior to each grazing by mowing a swath across each plot and weighing the fresh green forage. Relative palatability was observed during each grazing. Dur-

SUGGESTIONS FOR ESTABLISHING A PASTURE ON IRRIGATED LAND

1. Obtain only high quality seed. Only certified ladino clover is sure to be ladino. It costs more but is worth it.
2. Plant early in the spring on a firm, well prepared and well fertilized seedbed.
3. Use a cereal nurse crop, preferably barley, to control weeds. Plant not to exceed 50 lbs. per acre.
4. Place the pasture seed in the upper half inch of soil. Generally a cultipacker will help to firm the soil after seeding. Remember that a too loose seedbed is the most common cause of poor pasture stands.
5. Irrigate at regular intervals while the nurse crop is growing, and again as soon as it is removed. Irrigate to meet the requirements of the pasture mixture rather than the nurse crop.

ing 1944 and 1945, the third harvest was made on September 5 so that the yields reported represent production to that date. In 1946, other considerations necessitated that the third harvest be made by August 6, so that the 1946 yields represent production to that date (the plots were grazed a fourth time, but quantitative data were not obtained preceding the fourth grazing). The 1946 data, therefore, represent a season 30 days shorter than for 1944 or 1945. It is for this reason that 1946 yields are low, and not because the plots had passed their most productive age, except in some mixtures to which attention will be directed.

Three years' data (three harvests each season) for standard mixture no. 1 and the 10 highest yielding combinations are summarized in table 1. The data show the general superiority in forage production (harvested by machinery) of mixture 22 which is rather low in palatability. Two mixtures containing red clover as the only legume (34 and 36) produced well the first two years but, as red clover largely disappeared during the third season, yields dropped greatly. Red clover also went out of mixture 22, but in it ladino clover and alfalfa remained to sustain production. In all the other mixtures listed in table 1 (except standard mixture no. 1) either ladino clover or alfalfa or the two together was successful in sustaining production through the third season. However, it was noticed during 1946 that a considerable amount of alsike and ladino clover had come into the brome-alfalfa plots. Mixture no. 5, tall fescue and ladino clover, has been a high producer, but it, too, is low in palatability.

Use of tall fescue raises an important question. It is the only high producing grass that is unpalatable. Is it a high producer in terms of milk production per acre? The authors do not know the answer, but it was observed that when the more palatable mixtures had been well utilized milk flow dropped, while some plots containing an abundance of tall fescue had scarcely been touched. If dairy cattle are capable of developing a liking for tall fescue to the extent that they will graze it eagerly, which is essential for maximum milk production, the process is very slow because after repeated exposure to tall fescue during three seasons, no progress has been noticed.

In various parts of the country tall

Table 1. Yield, palatability, and anticipated longevity of 10 high yielding pasture mixtures compared with standard mixture no. 1

Mixture no.	Species and lbs. of seed per acre	Green wt. yields in tons per acre*			Aver. yield 3-yr.	Relative palatability rating	Longevity
		1944	1945	1946†			
		tons			tons		
22	Smooth brome (4), orchard (3), tall oat (4), tall fescue (4), alfalfa (3), ladino clover (2), red clover (3).	13.71	19.52	12.27	15.17	Moderate to low	Peren'al
34	Smooth brome (20), red clover (5).	13.91	16.40	8.56	12.96	Moderate	2-yr.
5	Tall fescue (16), ladino clover (4).	8.70	14.46	12.96	12.04	Low	Peren'al
36	Orchard (16), red clover (5).	11.81	14.83	8.42	11.69	Moderate	2 yr.
15	Orchard (8), smooth brome (10), ladino clover (2), Ranger alfalfa (3).	8.44	14.14	11.35	11.31	Moderate	Peren'al
27-16-6	Smooth brome (20), Ranger alfalfa (5).	7.75	13.80	10.76	10.77	Moderate	3 yr. or more
25	Tall oat (10), smooth brome (10), ladino clover (4).	8.12	12.83	10.23	10.39	High	Peren'al
10	Meadow fescue (16), ladino clover (4).	8.40	12.65	10.06	10.37	High	‡
8-3	Orchard (16), ladino clover (4).	8.19	12.47	10.43	10.36	High	Peren'al
11-14	Smooth brome (20), ladino clover (4).	7.40	13.23	9.91	10.18	High	Peren'al
Standard mixture no. 1	Smooth brome (4), orchard (3), perennial rye (3), meadow fescue (4), Kentucky blue (4), alsike clover (2), white clover (3).	6.77	8.43	7.79	7.66	Moderate	Peren'al

* To obtain approximate air-dry weights multiply green weights by .23.

† In 1946 the yields present production only to Aug. 6; quantitative data were not obtained preceding the fourth grazing, hence yields are lower and not because plots had passed their most productive age.

‡ Meadow fescue dropped out rapidly after the first season, leaving a predominance of ladino clover. Even though capable of high production, pure ladino clover pastures are not recommended because of the danger from bloat.

fescue and some of the strains derived from it (such as Alta fescue and Kentucky 31 fescue or Suiters grass) are receiving much favorable publicity. These strains, and others, have been included in these pasture studies, in a series where 100 strains of grasses and clovers are under observation. The authors are not aware of any differences in palatability among these strains.

High yielding mixtures listed in table 1 depend upon rotation grazing and high fertility for maximum production.

There is a widespread belief that pastures should contain more than one grass and one legume, one of the chief reasons being that a higher production will be maintained throughout the season. The present investigation does not support this idea, but it is quite probable that broad mixtures would be adapted to a wider range of soils and other environmental conditions, and may be just

tified on that basis, at least until more is known about the range of adaptation of the various species. Under conditions to which high producing grasses and legumes are considered to be well adapted, it would seem inadvisable to add less productive species merely to widen the range of adaptation. On this basis the safest mixture capable of high production, under the conditions of the experiments reported herein, would con-

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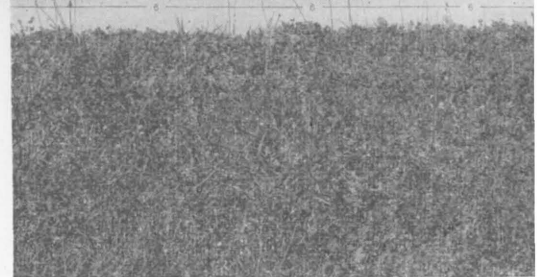


Fig. 1. Kentucky bluegrass and Idaho grown white clover: This is representative of mixtures containing Kentucky bluegrass or perennial ryegrass with low growing clovers. When these low yielding species are planted in simple or broad mixtures the yields approximated 75 percent of standard mixture no. 1. The relative yields of the high and low mixtures are reflected by the height of forage as indicated by figures 1 to 5

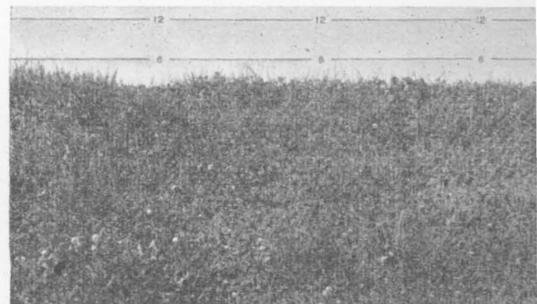
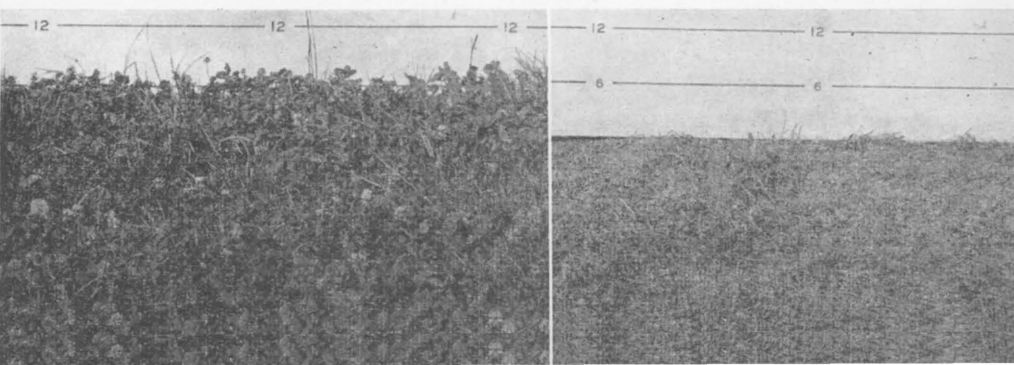


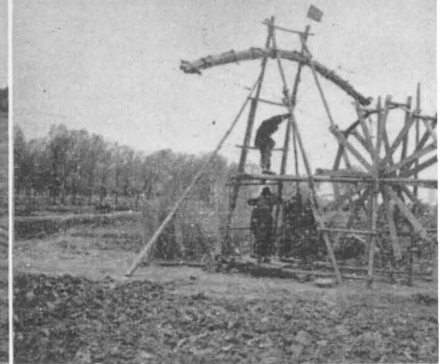
Fig. 2. Kentucky bluegrass and strawberry clover: In this experiment strawberry clover is at least equal to any of the sources of common white clover in both production and palatability



Fig. 3. This orchard grass and ladino clover plot is also representative of the brome grass and ladino combinations. The 10 highest yielding mixtures outyielded standard mixture no. 1 by 50 percent and the Kentucky bluegrass and small clover mixtures by 105 percent. Orchard grass, brome and ladino, together with red clover and alfalfa appear to offer the greatest promise of high production on fertile soils with rotation grazing

Fig. 4. Ladino clover in almost pure stands or when grown in association with palatable grasses is completely utilized by the grazing animal. Even though these plots have been grazed to the degree shown nine times during the past three years, the stand of ladino clover has not been reduced





Top left, Winter wheat in rows near Peiping in March; center left, Graves in a wheat field or wheat in a grave yard near Peiping. Considerable land near cities is unproductive because of graves. Crops are planted all around the mounds, but not on top; lower left, The pony cart moves most of north China's produce; center, Irrigating plots at the government experiment station near Peiping with water drawn from a well by hand; right, Deep well drilling outfit made entirely of bamboo and operated by hand. A man walking in the "squirrel cage" raises and lowers the tools and the big bow aids in jiggling

FARMING ON THE NORTH CHINA PLAIN

By D. W. PITTMAN

Because of the shortness of the growing season and the difficulty of obtaining water, not much rice is grown on the northern plains except in a few regions near the coast such as near the village of Chun-liang-cheng east of Tientsin where the Japs had installed electric pumps for raising water some 6 or 7 feet to the fields. The electricity is generated by burning coal which is abundant there.

The principal crops of the northern plains are winter wheat, millet, corn, kaoliang, sweet potatoes, soybeans, peanuts, grain-sorghum, barley, sesame, vegetables, fruit, and some cotton. Little forage is produced because the dairy industry is small and what little meat is eaten is largely mutton from range sheep of the hills, and garbage-fed pork. The few donkeys and ponies must live largely on straw, sweet potato vines, and a little barley.

The wheat is mostly sold to the cities where it is consumed in the form of noodles, boiled dumplings, some flat bread and cakes cooked on top of the stove, and some doughnut-like cakes fried in deep peanut oil. The northern villagers live largely on steamed corn bread—which contains some soybean flour and is made without baking powder, so it is quite soggy and sticky, but nutritious—sweet potatoes, millet mush, and Chinese cabbage, which does not form heads and looks like celery. For some reason, the Chinese almost never use ovens, so all their bread-like products seem heavy and only half-cooked to Americans or Europeans. In south China and among many of the northern city dwellers, rice takes the place of nearly all other grain products.

In the latitude of Peiping and south

all of the wheat is winter wheat and it seems that over half the land is planted to winter wheat each year. The wheat is planted in rather dense rows about 2 feet apart, each row being in a slight depression to hold all possible moisture during the dry winters. The rows are usually contoured. The wheat is sowed by hand, or occasionally with a home-made wooden drill, in furrows plowed with a simple plow with a flat blade like a potato digger, only smaller. The furrow is covered with a light scraper blade followed by a stone roller. Farther south in Shantung, where the climate is still drier, the wheat plants are placed individually in rows both ways about 2 feet apart, each plant being in a small depression in the soil.

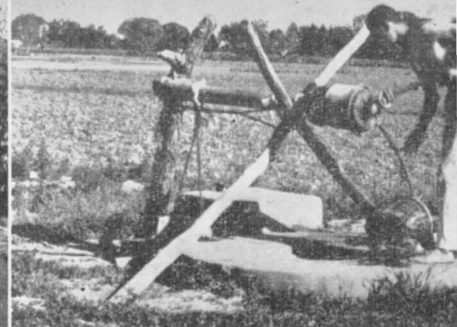
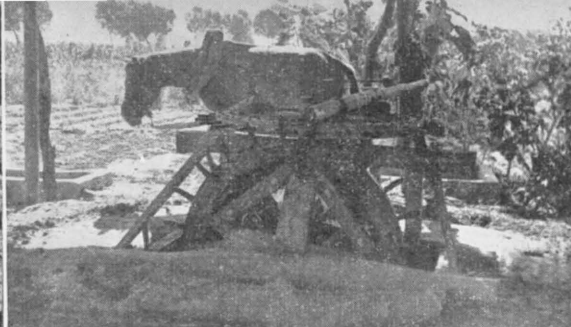
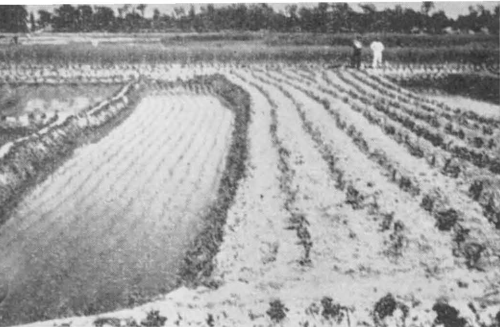
Practically all the wheat land is double cropped in the summer to millet, short season corn, kaoliang, sweet potatoes or vegetables. The corn used for double cropping is a small, quick-growing yellow dent variety which yields poorly but can be harvested in time to plant wheat in October.

To get the wheat out of the way of the summer crops, it is usually pulled up by the root when the grain has barely turned, about the "milk" or very "soft dough" stage, and piled by the threshing floor to finish maturing.

The grain is threshed by a donkey, blindfolded to prevent his becoming dizzy, dragging a stone roller around in circles over a thin layer of unthreshed grain on a hard-packed threshing floor until the straw can be pitched to one side with a branched willow limb pitchfork and the chaff blown away by the wind as the grain is being sieved. The wheat roots and part of the straw are

EXCEPT for terraced rice lands near streams, the plains of north China include some of the most productive land of the country. Even so, this productivity is not maintained without constant effort on the part of the farmers. In the vegetable gardens adjacent to the cities where manure and night soil, carefully prepared and composted, are applied heavily and where water drawn from 20- to 30-foot wells by hand windlasses or donkey power water wheels is used freely, the productivity is very high, but in the sparsely fertilized and watered grain fields farther from the cities the yields are much lower. Average acre yields quoted from Cressey (1934) and from Buck (1937) give wheat 15 to 16 bushels, soybeans 12 to 17 bushels, corn 12 to 23 bushels, millet 21 to 23 bushels, and sweet potatoes 139 bushels.

D. W. Pittman, professor of agronomy, returned in December from a nine months' stay in China. While there he worked on sugar beet production problems.



Left, Alternate basins of rice and elevated beds of dry land crops is a common way of utilizing low lands with a high water table; center, The "Persian wheel" for irrigating from a well by horsepower produces about $\frac{1}{8}$ of a cubic foot per second; upper right, Drawing water from a well with a hand windlass and basket a man can produce an irrigation stream of about $\frac{1}{30}$ cubic foot per second; lower right, Pit for manure and night soil on a Chinese farm. All manure is carefully saved and composted

used for fuel and the rest of the straw for feed or for reinforcing mud walls.

In some districts a short-kerneled rice is grown between wheat harvest and wheat planting. Two days after a field has a crop of wheat just turning, the same field may be under water and supporting a crop of green rice a foot high which has been transplanted into it, after flooding, one plant at a time. After such double cropping for a few years land is usually given a rest by omitting the wheat one winter and planting a larger white dent corn or some other longer season crop the next summer.

The climate of the north China plain is in a large measure responsible for the cropping system and is rather surprising to one who is not familiar with monsoon climates. From September through the winter until June it is surprisingly dry and arid, and one wonders how it is that trees can survive without irrigation in the villages and in some parks on the adjacent hills preserved as hunting parks for the former emperors. Suddenly in late June or early July it begins to rain hard and persistently. When the rains start, sections of walls go crashing down in many places each year. Rivers often overflow their banks and drown out vast areas, bringing flood famine to the population, who a few years before may have experienced a drought famine in the spring. The weather becomes oppressively hot and humid as in the humid tropics; everyone perspires excessively and a fan is almost as essential as food or tea.

During this hot, humid weather, the corn, millet, kaoliang, sorghum, and sweet potatoes, which are always planted on high ridges, grow very rapidly. Plant diseases and weeds also flourish but the native plants have become quite resistant to local diseases. About the last week in August the temperature moderates and by mid-September it has become arid again so that corn, rice,

millet, and other summer crops can be matured and harvested and the fields planted to wheat before the moisture has all evaporated again.

Such a system of agriculture, except that kaoliang, sorghum and millet took the place of corn before the discovery of America, and including apparently about 25 drought famines and an equal number of food famines every thousand years, has been practiced by the ancestors of the Chinese for at least 4,000 years.

NEW PUBLICATIONS

Bul. 326. Rainfall and irrigation in relation to soil erosion, by Willard Gardner, John Hale Gardner, and C. W. Lauritzen. Physics Department in cooperation with the U. S. Soil Conservation Service. 12 p.

This bulletin points out various facts regarding precipitation and irrigation water in relation to the wearing away of soils. It demonstrates that streams beyond certain specified sizes and slopes will continue to erode soils indefinitely, while in streams of less volume and on lower slope the soils will tend to stabilize.

Bul 327. Biennial report, 1944-46, R. H. Walker, director. 42 p.

This publication presents a statistical summary of the work during the past biennium. It outlines the need of the Station for additional funds for new research, new buildings, and other facilities.

These bulletins may be obtained on request from the Utah Agricultural Experiment Station, Logan.

John V. Christensen, assistant professor of animal husbandry, has accepted a position with the U. S. Bureau of Animal Industry as wool specialist at the Southwestern Sheep Breeding Laboratory at Fort Wingate, New Mexico. Professor Christensen took his M.S. degree at Utah State in 1941 and has been on the staff either here or at the B.A.C. since that time.

PLANS BEING COMPLETED FOR LEGUME RESEARCH STATION

G. E. Bohart, recently appointed by the U. S. Bureau of Entomology and Plant Quarantine to the staff of the legume research station in connection with the Agricultural Experiment Station at Logan, spent a week on the campus helping plan the research program which will begin immediately. According to F. E. Todd, who is in charge of this division of the work, Mr. Bohart will investigate the problem of wild bees in alfalfa pollination. Mr. Bohart returned to Berkeley to complete work for the doctorate degree. He will move to Logan the first of May to begin work on the project.

Five other scientists who will work on the alfalfa seed production investigations are already on the Logan campus. They are Dr. J. W. Carlson who has worked on the problem here for a number of years, M. W. Pedersen who came a year ago from the University of Nebraska, both working for the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering; F. E. Todd from the headquarters office at Beltsville, Maryland, F. V. Lieberman, transferred from Delta where he was working the same problem, and S. J. Snow from South Carolina. These men are all employed by the U. S. Bureau of Entomology and Plant Quarantine.

One other scientist is yet to be appointed to work on beneficial insects in alfalfa seed pollination.

Newcastle Disease in Poultry

This Disease Potential Threat to Poultry Industry Through Its Effect on Egg Production

By M. L. MINER

THE PROBABILITY of bacterial warfare in the early years of the war led to the discovery in 1944 of Newcastle disease of chickens in the United States. In 1942 a laboratory was set up to study means of combating highly contagious, fatal diseases of poultry not found in this country, but which may be deliberately introduced. At this laboratory Newcastle disease was shown to be identical with a disease already present.

Livestock sanitary officials are on continual lookout for foreign diseases, yet because of an altered appearance from its European counterpart, Newcastle disease in America was present at least ten years and widely spread before its identification.

This disease is highly contagious and is caused by a filterable virus. It manifests itself primarily by respiratory and nervous symptoms. Chickens of all ages are susceptible. Of the other avian species turkeys, guinea fowl, ducks, geese, pigeons, pheasants, partridges, crows, sparrows, mayas and martins have been reported to be affected in natural outbreaks.

Over 20 years ago, in 1926, the disease was first reported "as a highly diffusible and fatal infection of poultry, prevalent in the Dutch East Indies." In the same year it was seen at Newcastle-on-Tyne in England by Doyle. He named it after the town and demonstrated the causative agent to be a filterable virus. Since that time it has been reported in many parts of the world.

The first description of this virus disease in the United States was from California in 1942. At that time it was not recognized as Newcastle disease but called a respiratory nervous disorder of chickens, and avian pneumoencephalitis. The latter name is a better one, it being more descriptive than Newcastle; for that reason there is at present some agitation to make it the accepted name. In 1945 the disease was identified in several states on the eastern coast. At the present time it has been definitely diagnosed in 30 states, of which Utah is one.

Dr. M. L. Miner is the Station poultry disease specialist. Dr. Miner took his undergraduate work at Utah State and his D.V.M. at Iowa State. He was on the Station staff at Michigan State before coming to Utah in 1943.

Of considerable importance is the recent identification of the disease in Mexico in a virulent form similar to the European and Asiatic outbreaks.

Although it was not until 1942 that the disease was described in California, the infection was probably present there as early as 1935, being designated as "nine-day pneumonia" and "chicken flu." It probably has been in Utah for the past several years and has been called "California flu." The disease has been definitely diagnosed in chickens in Salt Lake and Utah Counties. Clinical evidence indicates that it is present in all parts of Utah, wherever chickens are raised. It is hoped that in the next year the extent of the malady in the state will be accurately ascertained.

Whenever the disease has appeared in other countries, one of its chief characteristics has been a high mortality reaching nearly 100 percent. In contrast, in this country there may be no mortality or a mortality of 5 to 10 percent, with extremes of 22 percent in older birds. In younger birds the death loss may vary from 10 to 60 percent. The recent outbreaks in Mexico have shown mortality of 80 percent or higher. It may be said that it would have been better for the poultry industry if the disease had first appeared in America in its most virulent form. Thus, in all probability, measures would have been taken to eradicate it as was done with fowl pest in 1925 and 1929. The insidious nature of the American strain has let it become established in most parts of the country.

A characteristic manifestation of Newcastle disease is its sudden appearance and rapid spread through the flock. Several birds may show the respiratory disturbances and in a few days the entire flock is affected. The outbreaks assume a subacute or chronic course, with few sudden deaths and low mortality. In the acute cases septicemia or toxemia soon kills the birds, tending to mask the nervous symptoms. In the chronic cases, the first respiratory disturbances are followed, after a period of days, by the various nervous symptoms.

A description of the symptoms, as found in outbreaks in this country, will show the varied manifestations in three

age groups. In chicks from a few days to 4 or 5 weeks of age, the first symptoms usually are difficulty in breathing, with coughing and rattling breathing sounds. The birds are depressed, standing around with head drawn in and slightly drooped; the wings are dropped to some extent. Many birds have a peculiar rapid, low chirp. As the disease progresses, in a few days weakness, paralysis, and stupor may appear. With nervous system involvement, twitching of the head and neck first appears, then partial or complete paralysis of the neck, wings and one or both legs. A condition commonly observed in birds of all ages is incoordination of action of the neck muscles, resulting in the head's being either drawn straight back between the shoulders, drawn downward and backward toward the breast and twisted to either side, or drawn to the right or left. The chicks may walk in circles or walk backwards, especially when excited. Birds that are not too seriously affected retain their appetite and are able to feed themselves despite the muscular incoordination. The individuals that become paralyzed completely usually have a rhythmic twitching of the body and legs and go into a coma in which they soon die. In partially paralyzed birds which show incoordination, recovery may occur and a majority of these birds retain the nervous symptoms indefinitely. Although in acute cases death may occur in 48 hours after symptoms appear, the usual course of the respiratory symptoms is two to three weeks and when nervous symptoms are present they will continue considerably longer.

In chickens of broiler age, symptoms resemble those in chicks, with the course lasting longer. Growth and development are retarded. As the age of the chicken increases, resistance to the disease increases.

In nearly mature and adult birds, the respiratory symptoms are most prominent, although some flocks may have a few cases of nervous system involvement. Here again the birds have difficulty in breathing, cough and gasp. Improvement occurs in 7 to 10 days. The greatest loss in laying flocks is the almost complete cessation of egg production within a week of the onset of the

disease. Egg production returns to normal slowly, taking one to two months to reach a profitable level.

In some cases in laying flocks, respiratory symptoms are not prominent, yet the birds show impairment of appetite and depression, sitting around in a droopy attitude. Within a week, egg production drops. At the beginning of the outbreaks there is a large number of floor eggs, many of which are soft or rough shelled. The birds begin to improve in 7 to 10 days, although in these cases a higher number of chickens develop nervous symptoms as described in chicks. Egg production does not return to normal before 4 to 8 weeks.

With egg production the most important part of Utah's poultry industry, the potentiality of economic loss is great if Newcastle disease becomes widespread. To the individual poultryman, one to two months' loss of egg production would mean loss of profit for the entire year.

Newcastle disease is spread from flock to flock as are all other infectious diseases. Such things as introduction of infected or recovered carrier birds into a flock, use of contaminated feed, feed

sacks, and chicken and egg crates, and admission to chicken houses of visitors from infected premises are good means of starting the disease in a flock. Means of disease transmission need further study. Once the disease is introduced spread is by contact with the droppings and nasal excretions primarily in the feed and water.

Postmortem examination reveals nothing characteristic. There are few lesions. There may be some exudate in the bronchi and trachea and the air sacs may be cloudy and thickened.

Many complicating factors in diagnosing Newcastle disease make the use of laboratory procedures necessary. There are four virus diseases which produce symptoms and lesions similar to Newcastle disease. These are indistinguishable from it by observation alone. Infectious bronchitis will show the same respiratory symptoms but usually higher mortality in baby chicks. Epidemic tremors will cause almost identical nervous symptoms in young chicks. In older birds, infectious bronchitis and laryngotracheitis will produce respiratory difficulties and almost as much loss in egg production as Newcastle disease, but no

nervous symptoms. The paralysis and incoordination of the neck and leg muscles of avian leucosis (fowl paralysis) simulate the nervous symptoms in older birds.

Besides these infectious diseases, there are two nutritional diseases of chicks that resemble Newcastle disease. Encephalomalacia due to lack of vitamin E will cause, in chicks 2 to 6 weeks of age, neck and leg muscle incoordination; the drawing downward and backward toward the breast and twisting of the head is commonly seen. Curled toe paralysis (deficiency of riboflavin) will cause partial paralysis of the legs.

A vaccine has been made and widely used in California, but in its present state of development is inadequate for the control of the disease. Immunity produced by such a vaccine rarely lasts over two months. Repeated vaccination and handling of the birds is too costly.

Since the disease is in Utah and possibly quite prevalent, prevention of its introduction into individual flocks requires the common sense use of the laws of sanitation.

FERTILIZER PRACTICES

(Continued from page 5)

gen to phosphorus between 1 to 3 and 1 to 5. Some common mixtures on sale or that may be prepared by home mixing are:

High nitrogen to phosphate ratios

16-20-0—Some on sale as ammonium phosphate, or prepared by mixing 1 bag of ammonium nitrate with 1 bag of treble superphosphate. See page 13 for recommended rates of application.

13-15-0—Prepared by mixing 2 bags of ammonium sulfate and 1 bag of treble superphosphate. Use at rates recommended for 16-20-0.

10-20-0—On sale, or prepared by mixing 1 bag of ammonium sulfate and 1 bag of treble superphosphate. Use at equal or slightly higher rates than 16-20-0.

8-12-0—On sale. Use at twice the rate recommended for 16-20-0.

10-10-0—Prepared by mixing 1 bag of ammonium sulfate and 1 bag of single superphosphate. Use at about twice the rates recommended for 16-20-0.

Low nitrogen to phosphate ratios

11-48-0—Some on sale as ammonium phosphate.

4-16-0—On sale. Prepared by mixing 1 bag of ammonium sulfate and 4 bags of single superphosphate. Use at three times the rate recommended for 11-48-0.

6-30-0—On sale. Prepared by mixing 30 lbs. of ammonium sulfate with 70 lbs. of treble superphosphate. Use at nearly two times the rate recommended for 11-48-0.

Mixed Fertilizers Containing Potash

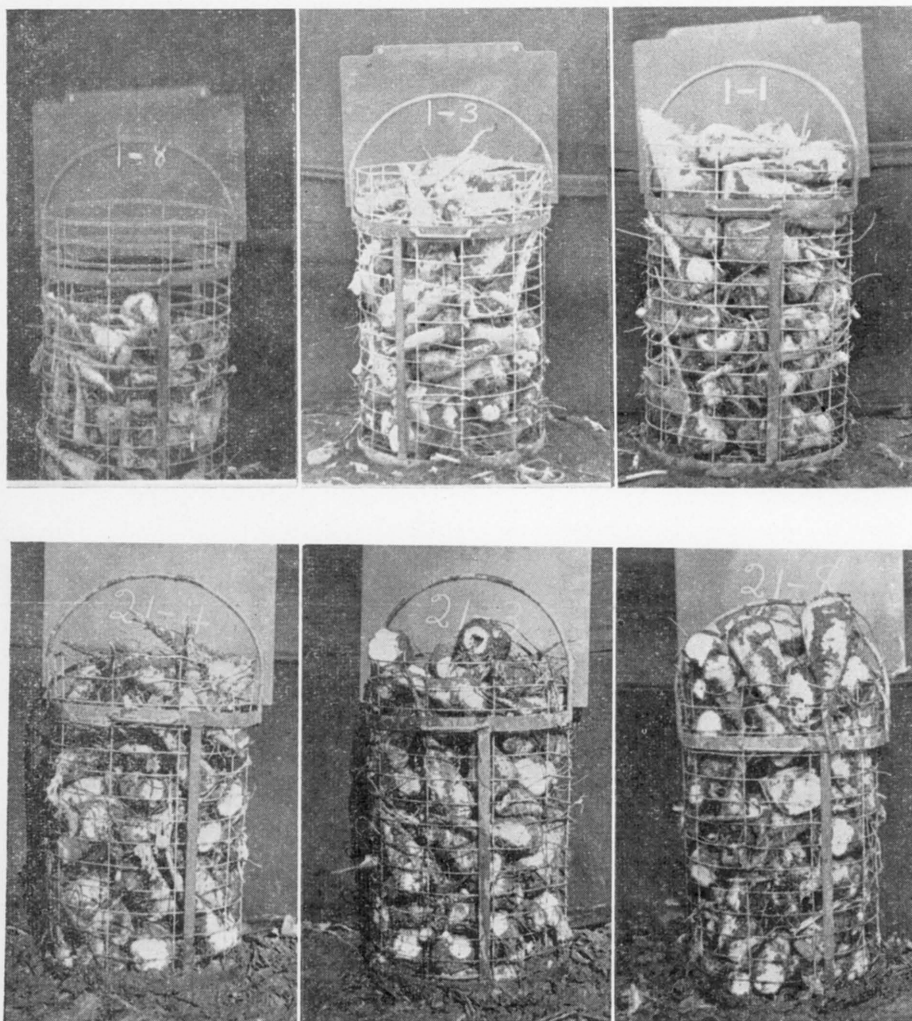
Several mixed fertilizers will be on sale containing potash. No experimental test under direction or observation of Agricultural College staff members has shown a need for potash on Utah soils. It is recognized, however, that there

may be some response to potash in a few instances. According to general experience, potash need will first appear on very sandy soils. The general recommendation is not to pay the added cost for potash-containing fertilizers unless a definite need has been established. Fertilizers on sale in this group include: 10-18-4, 10-10-5, 4-24-4, 4-16-4 and 4-12-4.

Use at rates equivalent to those recommended for fertilizers containing similar contents of nitrogen and phosphate.

Liquid Fertilizers

During the past two years there has been an increased sale of liquid fertilizer materials for distribution in irrigation water. Many questions remain unanswered on the desirability of these materials and the best procedures for their application. In general, the cost of plant food in these preparations is too high to justify their use. Unless convinced by past experience of the economy of these materials, their use is only suggested on a limited experimental basis.



Yields of sugar beets produced on plots treated with various amounts of fertilizers. All plots received the same phosphate treatment. The plots on which the beets in the upper row were grown received no manure, those on the bottom row received manure in addition to commercial nitrogen. Top, left to right, no nitrogen, yield 16.2 tons per acre; 80 lbs. nitrogen, yield 21.4 tons; 160 lbs. nitrogen, yield 23.8 tons per acre. Bottom, left to right, no nitrogen, yield 20.2 tons per acre; 80 lbs. nitrogen, yield 22.4 tons; 180 lbs. nitrogen, yield 25.3 tons. From a complete fertilizer and moisture study on sugar beets conducted at the Utah Agricultural Experiment Station in cooperation with the U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Amalgamated and Utah-Idaho Sugar Companies

Materials of Questionable Value Sold as Fertilizers

Gypsum

Gypsum contains calcium and sulfur. Value has been found from gypsum only on soils containing black alkali. If black alkali is suspected on your farm, send a soil sample to the college through the county agent or Soil Conservation Service representative for analysis and recommendation before purchasing gypsum.

Sulfur and Sulfur Materials

Like gypsum, sulfur materials have no general value on Utah soils. They are useful only on soils containing black alkali. Obtain a soil analysis before making a purchase.

Sulfur Dioxide

Seemingly exaggerated reports on results from use of this material have come from commercial agencies in California. It is not recommended for soil treatment here.

Borax Preparations

There is no evidence of boron deficiencies in soils of the Great Basin Area. Toxic amounts are found in many soils of the Uinta Basin and in areas irrigated by water from the lower Sevier. Do not buy boron materials as fertilizers for Utah except on an experimental basis—harm rather than benefit might result.

Minor Elements

Various elements needed in small

quantities for plants are occasionally sold as fertilizers in the state. More often fertilizers containing nitrogen and phosphorus are advertised as being especially desirable because of a content of such elements as copper, zinc, manganese, iron, or even other elements. Although many tests have been made, no response has been obtained in Utah on common field or vegetable crops from fertilizer treatments with these elements. Some cases of deficiency of iron, zinc, and manganese have been observed with fruit trees, but affected trees have not been helped in most cases by soil treatments. If deficiencies of these elements are suspected, consult your county agent and have him get advice on the problem.

Soil Fumigants

Some stimulation in plant growth has been observed on land planted following soil fumigation. This increased growth does not justify the use of fumigants unless the presence of such parasites as nematode endangers crops.

Feathers

Feathers have practically no value in themselves as a fertilizer. Frequently, in poultry process plants considerable blood becomes mixed with feathers. Blood is an excellent fertilizer material and is responsible for most benefits claimed for feathers.

Organic Wastes

Waste products from factories, fish hatcheries, sewage plants, etc., are often offered locally for fertilizers. Their value depends on composition. If they are available at low cost, they will probably be worthwhile to use. Some benefit will usually result from application to land. If large quantities are for sale and the price is questionable, obtain a chemical analysis before purchasing.

Miscellaneous Materials

Numerous materials in addition to those mentioned are offered for sale for soil treatment. Among those sold in the past have been vitamins, lime, clay, and coal. Such materials are usually of little value. Lime is important on the acid soils of the humid east but there are few, if any, acid farm soils in Utah. If in doubt about such materials, inquire from your county agent or write to the Utah State Agricultural College.

Methods of Fertilizer Application

In the past, most fertilizers in Utah have been applied broadcast and har-

RECOMMENDED FIELD APPLICATION PRACTICES — 1947

Crop	Fertilizer	Lbs./acre	Suggested alternative practices	
Sugar beets	16-20-0*	300 or	(1) Apply fertilizer broadcast on plowed land and harrow into seed bed. (2) Use fertilizer drill attachment if available. If fertilizer is dropped with seed, use not more than .75 lbs. of 0-43-0 per acre and no mixed fertilizer or nitrogen. (3) Side dress nitrogen and mixed fertilizers with fertilizer cultivator attachment at about time of first irrigation after thinning. Crops receiving only phosphate at or before planting may be side-dressed with a nitrogen fertilizer later if tops are small or light in color.	
	8-12-0	500 to 600 or		
	10-20-0*	300 or		
	0-43-0	150 or		
	0-18-0	300 and		
	20- 0-0*	200		
Alfalfa and clovers	0-43-0	200 to 300 or	New plantings. (1) Apply phosphate with plow attachment. (2) Apply broadcast on soil surfaces and plow under. (3) Apply broadcast on plowed land and harrow in. (4) Drill into seed bed as deep as possible with fertilizer attachment on grain drill. Old stands. (1) Apply fertilizer broadcast on soil in late fall or early spring and harrowed into soil. (2) Drill into soil in early spring with grain drill having a fertilizer attachment.	
	0-18-0	400 to 600		
Irrigated pastures	16-20-0*	300 or	New plantings. Apply as for new plantings of alfalfa. Established pastures. Apply fertilizer broadcast in early spring. Apply phosphate every second or third year. Nitrogen fertilizers stimulate grass growth. Phosphate fertilizers stimulate the clovers in mixed pastures.	
	10-20-0*	300 or		
	0-43-0	200 or		
	0-18-0	450 and		
	20- 0-0*	200		
Potatoes	16-20-0*	200 to 300 or	(1) Apply broadcast on plowed surface in spring and harrow in.	
	10-20-0*	200 to 300 or	(2) Side dress to each side of rows at planting time with planter attachment.	
	20- 0-0*	200 to 300	(3) Side dress at time of first irrigation with cultivator attachment.	
Beans, dry	6-30-0*	200 to 400 or	(1) Apply broadcast on plowed soil in spring and harrow in.	
Beans, snap	11-48-0*	150 to 300 or	(2) Side dress at sides of rows with a fertilizer attachment at planting time.	
Beans, lima				
Onions	4-16-0*	300 to 600	(3) Side dress row crops with a cultivator fertilizer attachment at time of first irrigation.	
Peas				
Tomatoes	16-20-0*	200 to 400 or	Tomatoes: Starter solutions for use in tomato transplanting usually stimulate a quicker growth. A fertilizer such as 4-12-4 at 10 lbs. per 100 gallons of water makes a satisfactory solution.	
Cabbage	10-20-0*	200 to 400 or		
Carrots	10-20-0*	200 to 400 or		
Corn, silage	8-12-0*	300 to 500		
Corn, sweet	10-20-0*	300 or	Apply 16-20-0, 10-20-0, or their equivalents to unmanured plowed land in early spring. Land heavily manured can be fertilized with 200 lbs of treble superphosphate or 400 lbs. of 18% phosphate. Side dress with 100 to 150 lbs. of 20-0-0 or 10 lbs. of 33-0-0 per acre at two-week intervals for three dressings beginning about August 1 in northern Utah. A hand pushed drill such as a Planet Junior can be used if larger equipment is not available.	
Wide-spaced celery				
Close-spaced celery				
	33- 0-0	300		
Sugar beet seed	20- 0-0*	400 and	Apply 150 to 200 lbs. 0-43-0 or equivalent, or 250 lbs. 16-20-0 or equivalent, on plowed land before preparing seed bed. If 0-43-0 is used, apply 100 lbs. 20-0-0 as side dressing in fall.	
	0-43-0	300 or		
	16-20-0*	600 or		
	10-20-0*	700		
Washington County	20- 0-0*	200 and	Apply 100 to 300 lbs. 20-0-0 or 200 to 400 lbs. 16-20-0 or equivalent as side dressing in spring.	
	0-43-0	250 or		
	16-20-0*	400 or		
	10-20-0*	500		
Northern valleys	20- 0-0*	200 and		
	0-43-0	250 or		
	16-20-0*	400 or		
	10-20-0*	500		
Vegetable seeds	16-20-0*	300 or	(1) Apply broadcast on plowed land, and harrow in.	
	Annual	10-20-0*	300 or	
		8-12-0*	500	
Vegetable seeds	16-20-0	400 or	Apply all phosphate or half of mixed fertilizer in fall before seeding. Side dress with 20-0-0 or other half of mixed fertilizer in early spring.	
	Biennial	10-20-0		400 or
		0-43-0		200 and
		20- 0-0		200
Berries	20- 0-0*	300 or	Apply to sides of rows in early spring on established stands of berries.	
	33- 0-0*	200 or		
	16-20-0*	300 or		
	10-20-0*	300 to 400		
Fruit trees, all		Lbs./tree per one inch diameter	Apply fertilizer two weeks before blossom stage.	
	20- 0-0*	1/2 or	(1) Apply broadcast and disk into ground.	
	33- 0-0*	1/3 or	(2) Drill in between tree rows with fertilizer drill. Phosphate fertilizers should be drilled or dug into ground to be effective. A phosphate-containing fertilizer need not be applied oftener than every second year. Nitrogen fertilizers are needed annually unless ample manure is available.	
	16-20-0*	1/2 or		
	10-20-0*	1/2 to 1 or		
	8-12-0*	1		

* If ordinary farm manure is applied, reduce fertilizers by 4 lbs. of nitrogen per acre (20 lbs. of ammonium sulfate) for each ton of manure applied. One ton of sheep or poultry manure can be considered equivalent to 2 tons of horse, cow or hog manure. Where heavy applications of manure are made, no nitrogen may be needed in commercial fertilizers for most crops.

rowed into the soil surface. Deeper placement will be obtained if the fertilizer is broadcast on a plowed soil surface before it is harrowed. It is more efficient and economical to place the fertilizer in bands near the plant row with some type of drill. Fertilizer placement with a drill has the following advantages over broadcast applications: (1) The fertilizer is placed in the proper position for plant roots to feed on it easily; (2) One hundred pounds of fertilizer drilled at the side of rows often increases yields as much as 200 pounds applied broadcast; (3) Fertilizer placed in bands does not come in as intimate contact with the soil and hence remains in soluble forms longer than broadcast fertilizer.

The coming year will probably find a large number of fertilizer drills on the market. For the average farmer a cultivator type of fertilizer distributing attachment is probably the most practicable. Such an attachment can usually be shifted easily from one piece of equipment to another and can be used on a number of crops. Be sure that the quantity of fertilizer applied by equipment purchased can be varied to low enough amounts for the concentrated fertilizers used in this area.

Recommended Field Application Practices

No single set of recommendations can be made that will apply to all soil and cropping conditions in Utah. The recommendations on page 13 are based on average soil conditions where farm manure is not applied. A footnote indicates the advisability for decreasing applications of nitrogen fertilizers in proportion to manure applications. Many soils contain adequate amounts of available phosphate for present crop needs. Under such conditions, phosphate can be omitted from fertilizers applied.

No minor elements are recommended. Some need for iron, zinc, and manganese has been observed, however, in fruit orchards. Consult a specialist if a need for these elements is suspected.

NEW TEXT ON FERTILITY AND MANAGEMENT OF IRRIGATED SOILS

Issued by Thorne and Peterson

A new textbook on the fertility and management of irrigated soils has recently been released in preliminary form by the authors, Dr. D. W. Thorne, associate professor, and Dr. H. B. Peterson, assistant professor of agronomy and soils, Utah State Agricultural College.

Because soils texts have been written mainly for humid regions and ignore the problems of irrigation, the authors have written this book to explain the principles and practices of farming under irrigation and dry land conditions. The text has been issued in mimeographed form for use in classes this year. After revision in the light of classroom use, it will be published for use in colleges in the western region of the United States where irrigation is practiced.

Both the authors are authorities on problems of western soils. Dr. Thorne took his undergraduate work at Utah State and his M.S. and Ph.D. degrees at Iowa State College. He served on the staffs at Iowa State College, University of Wisconsin, and Texas A. and M. College before coming to Utah State in 1939 as associate professor of agronomy and soils. Dr. Peterson is a graduate of the B.Y.U. and the University of Nebraska. He has been a member of the U.S.A.C. faculty since 1940.

C. J. Sorenson, professor of entomology, is on a three months' leave of absence from the College. Professor Sorenson is spending this time visiting the leading institutions in his field. Professor Sorenson has done outstanding research on the lygus bug and its relation to alfalfa seed production.

PASTURES FOR DAIRY CATTLE

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sist of brome, orchard, ladino, alfalfa, and red clover.

Because of the exceptional possibilities of some of the mixtures included in this study, and the many questions left unanswered, another series of plots containing 32 mixtures was seeded in the spring of 1946. These mixtures have been designed to give information on the part played by individual species. From these tests it is hoped to be able to answer such questions as: What does alfalfa contribute to the mixture proposed above? and, Can Reed canary grass replace tall fescue in mixture 22 without loss in yield? Data will be obtained from the new planting in 1947.

Robert K. Gerber has been appointed assistant professor of horticulture. Mr. Gerber was formerly research assistant in botany and plant pathology. He received his B.S. and M.S. degrees in horticulture at this institution and took work toward his doctorate at Ohio State. He worked for a commercial chemical company before returning to the college in 1944.

Dr. Willard Gardner and Dr. O. W. Israelson have returned from six-month leaves of absence. Dr. Gardner spent most of his time in Boston and at Harvard University. Dr. Israelson visited irrigation installations in the Northwest and in the Southwest. He also spent a month in Mexico.

Lewis W. Jones, assistant professor of bacteriology, will spend the next three months at Stanford University completing the course work for his Ph.D. degree.

Director R. H. Walker has been elected one of the members of the Committee of Nine set up by the Hope-Flannagan Act to review and authorize projects for cooperative research between two or more states to be financed by funds provided by this act. The other committee member from the western states is Director H. J. Henney of Colorado.

QUALITY IN CANNING PEAS

(Continued from page 1)

these studies was to make a comparison between yield and quality, as well as to determine the relative value of the tenderometer and sieve methods of grading. Inasmuch as quality is so important, it is necessary that a system of grading be used that will properly measure the quality of the product. In these studies, the percentage of starch was used as the criterion of quality and comparisons were made between grading methods and starch content. Both the tenderometer and the sieve methods were compared with the starch content of the peas.

The results on the sieve method of grading, for both the Early Perfection and Perfection peas, showed that there was no correlation between the size and the quality of the peas. For example, the percentage of starch of sieve grades 1 and 2, as well as 3, increased within the grade as the peas advanced in maturity. Consequently, peas harvested at the end of the season in these grades were of poorer quality than those harvested during the first part of the season.

On the other hand, where the tenderometer values were compared with the percentage of starch for the ungraded peas as well as with sieve grades 1, 2, and 3, there was a very high correlation value. That is, as the maturity advanced, the tenderometer value increased as did

Fig. 5. In other phases of this experiment Reed canary grass, when sown in combination with strawberry clover on wet land, or with a mixture of clovers on well drained land as illustrated here proved to be both high in production and palatability and was fully utilized

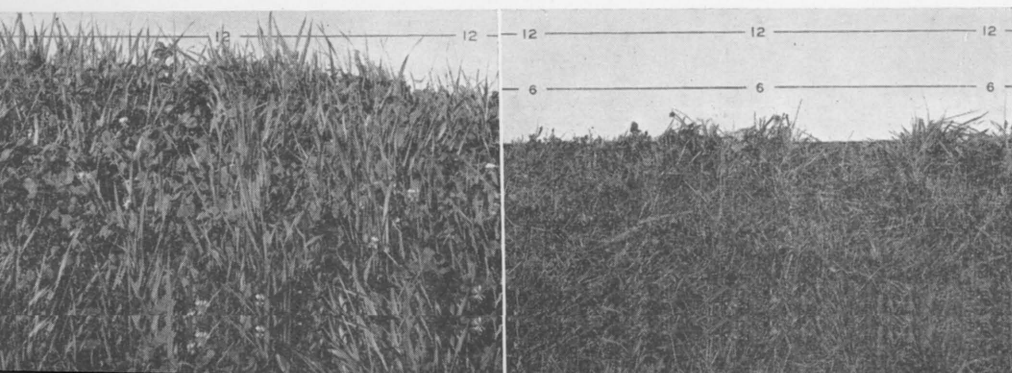


Table 1. Yield in tons per acre and increase in tons per degree rise in tenderometer value

Tenderometer value	Yields per acre		Increase per degree rise of tenderometer value	
	Early	Perfection	Early	Perfection
	Perfection		Perfection	
	tons	tons	tons	tons
90	1.58	2.05		
102	2.36	2.52	.065	.04
109	2.62	2.75	.037	.033
125	3.00	2.99	.023	.015
135	3.18	3.29	.018	.030

the starch content. This was true in all sieve grades. In the past, it has been assumed that the quality of sieve grades 1 and 2 was more or less constant, and hence the price on these grades remained the same throughout the season. Inasmuch as size is not an index of quality, a system of grading based on size is actually of little value. It is far better to use some method that is more closely associated with quality. Of course, testing of the starch content would be very desirable, but this method, while a satisfactory laboratory test, is not adaptable for testing large numbers of samples. The most satisfactory method at present is the tenderometer machine which has proved to be a good indicator of quality.

In the use of any new grading method, difficulties may arise. Proper adjustment of the machine must be made so that it is accurate. Furthermore, the samples must be properly taken. A consideration much more important than either of these, however, is the necessity of having a rate of pay for the various grades based on the quality of the peas. It should be such that growers, on an acreage basis, get more for better quality peas. This is necessary if there is to be an incentive sufficient for growers to harvest peas when they have reached the proper stage of maturity. In all cases, the price should be so adjusted that the grower will realize the greatest returns per acre at the tenderometer value the processor desires to pack the bulk of his peas.

In these studies, it was shown that there was an increase in yield as the peas advance in maturity. In table 1, it can be seen that the greatest increase in tonnage per degree of tenderometer reading comes during the early stage of maturity. In setting prices for the re-

spective grades, it will no doubt require a high price for young peas to offset this increase in tonnage which is so great during the early stages. However, the price differential should be sufficiently high between these top grades so that the grower who harvests his peas early in the season will not be penalized when compared to the grower who brings in his peas after they have passed the point of prime quality.

All growers should now recognize that present contract prices of peas in Utah have been adjusted to encourage quality production. Those growers who formerly received greatest returns per acre when harvesting the older peas can no longer do so. It is to the growers' advantage to begin harvesting sooner than has been the practice and push the harvest to completion as quickly as possible. It must be realized that the change in quality is rapid and the peas remain in the prime stage for a short time only.

It is not the purpose of the authors to set prices for the various grades, but it is felt that the price should be fair for both grower and processor. Likewise it is to the interest of both groups, as well as the welfare of the industry in Utah, to produce and process high quality peas. By so doing, present production cannot only be maintained but expanded.

It is the plan of the Experiment Station to conduct somewhat similar studies on other crops. In 1947, investigations will be started on stage of maturity of sweet corn and its influence on quality and yield.

PRESERVING EGGS

(Continued from page 3)

ious homemakers and commercial establishments.

Two eggs from each lot were scored

monthly and compared with fresh eggs. Each egg was scored by four people on six points which included odor, and appearance of yolk and white. The appearance of the yolk included mottling and height; of the white, color and consistency, and on the flash heat treated eggs, amount of visible coagulation due to heat treatment. The scores on each of these items ranged from 1 to 5 with 5 being the highest score possible.

The volume of beaten egg whites from 25 ml. of egg white and the amount of drip resulting were also measured and recorded. The beating was done in an electric household beater for three minutes. The beaten white was measured in a glass measuring cup and recorded. After this, the beaten white was transferred to a glass funnel and allowed to stand 5 minutes, after which the drip that collected in a graduate was read and recorded. The amount of drip is an indication of the stability of the beaten egg white, which is an important factor in cooking and baking, particularly in sponge and angel food cakes.

Results

Of the eggs treated by the flash heat treatment, those exposed to the boiling water for 7 seconds showed the best results at this altitude. Therefore, the data from this lot of eggs are used in the following discussion.

Results of this study as indicated by average scores on the whole egg and length of time the eggs held up under various conditions of storage are shown in figure 1. Eggs with various methods of treatment stored in a room where the temperature varied during the summer and fall months deteriorated very rapidly. Oil treated eggs scored the highest and held up the longest (12 weeks). At this time, these eggs scored higher than the flash heat treatment or the no treatment eggs at 4 weeks. Only a few eggs with no treatment were put in storage, but their scores showed a sharp decline within the 4 weeks that they were stored. Flash heat treated eggs were 50 percent dehydrated and had a score of 0 at the end of 12 weeks.

Under conditions of basement storage where the temperatures varied from 50° F. to 75° F., the waterglass treatment proved more desirable than either the no treatment or the flash heat treatment. After 28 weeks, the waterglass eggs scored approximately the same as the flash heat treatment group at 8

weeks. The latter had evaporated about 50 percent by the 24th week of storage. Oiled eggs were not stored in the basement.

All eggs held in the refrigerator had high scores for 24 weeks, after which time there was a rapid drop. Extreme evaporation on the flash heat treated eggs had occurred by the 32nd week.

While average scores on the whole egg show general trends, they do not indicate at what point deterioration takes place. The first signs of breakdown in the no treatment eggs were in odor and consistency of the white, a combination particularly objectionable to the consumer.

The flash heat treatment has been highly recommended by some workers, but in the present study even after one month of storage at either room, basement, or refrigerator temperature, these eggs did not hold up as well on color and height of yolk, and consistency of white as those with the other treatments, or no treatment. Also, the coagulated white flakes present on the egg would probably be undesirable to the consumer. With further storage, eggs having the flash heat treatment became very dehydrated. When stored in the refrigerator for 20 weeks, they were approximately 30 percent dehydrated; at 32 weeks, 50 percent. As dehydration proceeded, the whites and yolks became more concentrated. The yolks deepened in color, became glassy and transparent, while some became mottled. By the 32nd week, half of the egg was filled by the air sac as shown protruding in the left half of the shell in figure 2-C. The yolk stuck to the membrane so that when the egg was broken, the yolk oozed out with the concentrated white. The white remaining at this time was less than half that in a fresh egg (fig. 3). Room and basement storage accelerated dehydration. Figure 2-D shows a heat-treated egg stored in a basement for 32 weeks. The white and yolk had become a compact mass and stuck to the air sac membrane. In breaking the egg, the weight of this mass broke down the membrane. The extreme dehydration and the coagulated white flakes due to the flash heat treatment indicate that this treatment is not a good method of preserving eggs in Utah.

The oiled eggs held under room and refrigerator storage for 12 and 24 weeks, respectively, scored higher on almost every item inspected than eggs with any

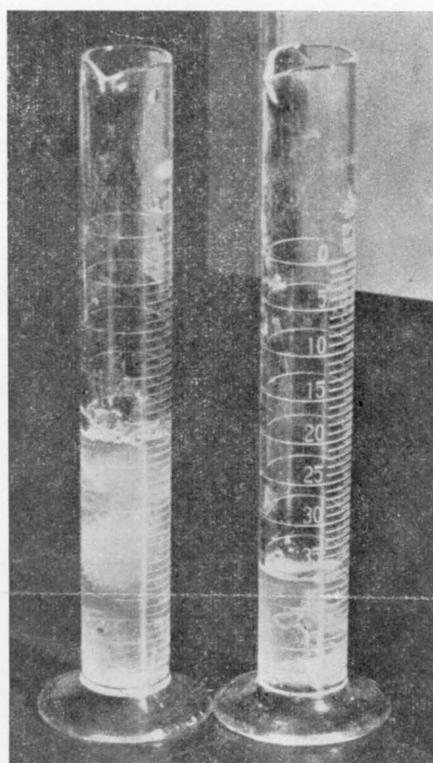


Fig. 3. Amount of egg white in a fresh egg (left) compared to the amount remaining in a flash heat treated egg after 32 weeks of refrigerator storage

other treatment. At room temperature, the first sign of deterioration was a slight flattening of the yolk, and the whites becoming somewhat watery. The oiled refrigerated eggs resembled fresh eggs for a longer period of time than any of the other eggs, and only when the entire egg had begun to deteriorate (after 24 weeks), did this characteristic disappear.

Waterglass eggs stored in the basement showed a general decline in scores to the 12th week, after which there was little change. Figure 2-B shows a waterglass egg stored in a basement for 32 weeks. Although the whites became quite watery and the yolks flattened

somewhat, the odor and general appearance were not objectionable at the end of 36 weeks.

The volume obtained after beating 25 ml. of egg white from all except the flash heat treated eggs was nearly constant during the time of the experiment, varying between $\frac{2}{3}$ to 1 cup. The volume of the beaten whites from the flash heat treated eggs after the 20th week decreased rapidly to $\frac{1}{4}$ cup. The drip after 5 minutes from the beaten white increased two to three times in all except the oiled eggs, up to the 12th week, after which it was negligible (0.5 to .0 ml.).

The results of this study indicate, therefore, that where refrigerator storage is available, oiled eggs stand up better than those with any other method of treatment or type of storage, for as long as 24 weeks. For the homemaker whose refrigerator space is limited, but who has a cool basement, the waterglass method is recommended. Although the whites become watery and the membrane holding in the yolk gradually weakens, these eggs are still in excellent condition for cooking and baking after 36 weeks of basement storage. At this time it is still possible to separate the yolk from the white when handled carefully. A lemon meringue pie made with waterglass eggs stored in the basement 36 weeks was equal in every respect to one made with fresh eggs. A lunch dish made from this same lot of eggs containing browned onions, corn and eggs scrambled together, was attractive and appetizing. A glass container with a tight cover keeps the eggs in a liquid medium for as long as 36 weeks with no off flavor or odor. Preserving eggs will mean a considerable saving to the thrifty homemaker who plans ahead to include in her menus an adequate number of eggs for each member of her family.

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